

Correlation and Sensitivity/Regression

We don't need this information yet but let's briefly talk about correlation and sensitivity so that you have a rough idea.

Correlation

Correlation tells us if there is a relationship between 2 assets.

I.e. when Asset A moves up, what are the chances that Asset B moves up too (or moves down)?

We say that Asset A and Asset B are:

Positive correlated when Asset A moves up and Asset B moves up. Or when Asset A moves down and Asset B moves down.

Negatively or inversely correlated when Asset A moves up and Asset B moves down. Or when Asset A moves down and Asset B moves up.

Statistic test for correlation

The statistic method to check for correlation is to calculate the Correlation Coefficient (aka the Pearson Correlation Coefficient or Pearson's r or r) between 2 assets.

There are many free resources on correlation coefficient so we won't reinvent the wheel, so here are some thorough explanation:

- <https://www.mathsisfun.com/definitions/correlation.html>
- <https://www.khanacademy.org/math/statistics-probability/describing-relationships-quantitative-data/scatterplots-and-correlation/v/correlation-coefficient-intuition-examples>

The correlation coefficient aka r ranges between -1 to 1. -1 for perfectly negatively correlation. 1 for perfectly correlated.

Sensitivity (Regression)

Sensitivity tells us what the relationship is between 2 assets.

I.e. when Asset A moves by 1%, how many percent does Asset B move?

Side note: The general rule of thumb is to first check if 2 assets are correlated before checking how sensitive their relationship is.

Statistic test for sensitivity

We use a statistical least squares regression to determine this sensitivity.

Again, we won't reinvent the wheel, so here is a more thorough explanation:

- <https://www.khanacademy.org/math/statistics-probability/describing-relationships-quantitative-data/regression-library/v/introduction-to-residuals-and-least-squares-regression>
- <https://statisticsbyjim.com/glossary/regression-coefficient/>

We are interested in the value of the slope, aka the regression coefficient. This regression coefficient will tell us the sensitivity of a relationship.

Example:

If when Asset A moves up by 1% and Asset B moves up by 3%, the regression coefficient is 3.

If when Asset A moves up by 1% and Asset B moves down by 3%, the regression coefficient is -3.

We are interested in the value of the regression coefficient as we will use that as a reference to know how much to hedge. More on this in the later lectures.